

## IMAGE FORMING SYSTEM

### BACKGROUND OF THE INVENTION

#### Field of the Invention

5           The present invention relates to an image forming system, and in particular to management of print data using a radio frequency identification (RFID) chip having a specific ID.

#### Related Background Art

          Conventionally, in order to copy a print, the print is scanned and an image  
10   of the print is copied on print paper using a copying machine or the like. In addition, in a case where the print is one printed by a printer, a file stored in a computer is retrieved to print the print anew. As exemplifying such a print system in which a computer and a printer are connected in this way, there is known a technique disclosed in Japanese Patent Application Laid-Open No. 2001-105689.

15           However, if the copying machine is used for the copy, naturally, the image quality of an image on a copied print may be deteriorated compared with that of the original print, or the image on the copied print may be inclined. In addition, in the case in which a print is printed by a printer, it takes a considerably long time to retrieve an original file for the print. Moreover, it is difficult to  
20   identify the original file if there are other files having similar contents.

### SUMMARY OF THE INVENTION

          It is an object of the present invention to solve the problems described above.

25           It is another object of the present invention to prevent image quality from being deteriorated in the copying of an image and to prevent a copied image from being inclined, and to reduce time and labor required for retrieval processing of

copy subject data by a user.

In order to solve such problems, according to an aspect of the present invention, an image forming system includes:

image forming means that forms an image relating to subject data on a  
5 recording medium having holding means that holds identification information specific to the recording medium;

detecting means that detects the identification information held by the holding means of the recording medium;

database means that, in accordance with an image forming operation for  
10 an image relating to desired subject data by the image forming means, stores first identification information, which is detected by the detecting means from the holding means of a first recording medium on which the image relating to the desired subject data is recorded, and the desired subject data in association with each other;

15 retrieving means that retrieves subject data corresponding to second identification information detected by the detecting means from plural subject data stored in the database means at a timing independent from the image forming operation for the image relating to the desired subject data; and

control means that controls, in accordance with a result of the retrieval by  
20 the retrieving means, the image forming means to form an image relating to the subject data corresponding to the second identification information retrieved by the retrieving means on a second recording medium different from the first recording medium.

Other objects and features of the present invention will be apparent from  
25 the following detailed description of the invention when considered in connection with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram schematically showing a main structure of an image forming system according to an embodiment of the present invention;

Fig. 2 is an external view of the image forming system according to the  
5 embodiment of Fig. 1;

Fig. 3 is a block diagram schematically showing an internal structure of the image forming system according to the embodiment of Fig. 1;

Fig. 4 is an external view of a printer;

Fig. 5 is a block diagram showing an internal structure of an output paper  
10 ID detector and a print request ID detector;

Fig. 6 is an external view of a print paper;

Fig. 7 is a block diagram showing an internal structure of an RFID;

Fig. 8 is a block diagram showing a structure of an image forming system according to another embodiment of the present invention;

Fig. 9 is a block diagram showing a structure of an image forming system  
15 according to a third embodiment of the present invention; and

Fig. 10 is a block diagram showing a structure of an image forming system according to a further embodiment of the present invention.

## 20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments of the present invention will be hereinafter described in detail with reference to the accompanying drawings, in which like reference numerals refer to like parts.

Fig. 1 is a block diagram schematically showing a main structure of  
25 respective image forming systems according to first to fourth embodiments of the present invention. A user file 11 is a file of an image or a document which a user can use. A print application 10 is an application to be operated by the user and is

provided for selection of a file to be printed from the user file 11. In addition, the print application 10 is provided with a function for converting the selected file into print data and delivering the print data to a printer service unit 30.

A database file 21 is a file in which print data and IDs of print paper are  
5 recorded in association with each other. A database application 20 includes a registration function, a reference function, and a deletion function. The registration function of the database application 20 allows registration of the print data and the IDs in a one-to-multiple relation. In other words, the registration function allows registration of plural IDs for one body of print data. By  
10 supplying an ID to the database application 20, the reference function of the database application 20 allows sending back of print data corresponding to the ID. By supplying an ID to the database application 20, the deletion function of the database application 20 allows deletion of print data corresponding to the ID.

A print control unit 40 is firmware which controls all operations relating  
15 to printing. An output paper ID monitor unit 50 is capable of: communicating with an RFID 80, which is attached to a print paper 90 which has just undergone printing shown in Fig. 6, in a non-contact manner with each other; always monitoring an output paper ID detector 70 (Figs. 4 and 5), which reads out ID information specific to the RFID 80; and when the ID is detected, immediately  
20 informing the print control unit 40 of the ID.

A print request ID monitor unit 60 is capable of communicating with the RFID 80, which is attached to the print paper 90 on which an image which a user desires to copy is printed, in a non-contact manner with each other; always monitoring a print request ID detector 71 (Fig. 5), which reads out ID information  
25 specific to the RFID 80; and when the ID is detected, immediately informing a printer service unit 30 of the ID.

The printer service unit 30 is software which communicates with the print

application 10, the database application 20, the print control unit 40, and the print request ID monitor unit 60 and controls operations of the entire system. The printer service unit 30 performs control of normal printing and extra copy printing.

Functions of the print application 10, the database application 20, and the  
5 printer service unit 30 can be realized by software using a computer as described later. The user file 11 and the database file 21 are accumulated in a storage unit such as a hard disk drive in a computer as described later and are used when executing the respective applications.

Here, operation for normal printing will be described. The user executes  
10 the print application 10, selects a file which the user desires to print from the user file 11, and instructs the print application 10 to print the file. When the printing instruction is received, the print application 10 reads out the designated user file 11, converts the user file 11 into print data, and delivers the print data to the printer service unit 30.

15 The printer service unit 30 transfers the delivered print data to the print control unit 40. The print control unit 40 creates a bitmap image on the basis of the transferred print data and controls a print mechanism of a printer 200 in Fig. 2, described later, to print the bitmap image on the print paper 90. In parallel with this print operation, the ID of the print paper 90 to be outputted is monitored  
20 through the output paper ID monitor unit 50.

The output paper ID monitor unit 50 monitors an output signal of the output paper ID detector 70 and, when the print paper 90 passes, detects the ID of the paper. When the ID information is detected, the output paper ID monitor unit 50 informs the print control unit 40 of the ID information. When the printing is  
25 completed, the print control unit 40 informs the printer service unit 30 of the completion of the printing together with the ID information informed from the output paper ID monitor unit 50.

The printer service unit 30 informs the database application 20 of the ID information informed from the print control unit 40 together with the print data. The database application 20 registers the informed print data and ID information in the database file 21 in association with each other. Then, when the registration of the print data and the ID information in the database file 21 is completed, the printer service unit 30 informs the print application 10 of the completion of the print operation based upon the delivered print data. When the notification of the completion of the print operation is received from the printer service unit 30, the print application 10 informs the user of completion of the printing.

10       Next, an operation for extra copy printing will be described.

A user brings an RFID part of the print paper 90, on which an image for which the user desires to print extra copies is printed, close to the print request ID detector (Fig. 4) 71, and causes the print request ID detector 71 to read the ID. The print request ID detector 71 informs the printer service unit 30 of the ID information. The printer service unit 30 sends the informed ID information to the database application 20 and instructs the database application 20 to retrieve print data corresponding to this ID information from the database file 21.

The database application 20 retrieves the registered database file 21. If the print data corresponding to this ID information exists, the database application 20 sends the related print data to the printer service unit 30. If the print data does not exist, the database application 20 returns information indicating failure of retrieval to the printer service unit 30. If the print data is sent back from the database application 20, the printer service unit 30 transfers the print data to the print control unit 40.

25       The print control unit 40 creates a bitmap image on the basis of the transferred print data and controls the print mechanism of the printer 200 to execute printing on the print paper 90. In parallel with this print operation, the ID

of the print paper 90 to be outputted is monitored through the output paper ID monitor unit 50. When the ID is detected, the output paper ID monitor unit 50 informs the print control unit 40 of the ID information.

When the printing is completed, the print control unit 40 informs the  
5 printer service unit 30 of the completion of the printing together with the ID information informed from the output paper ID monitor unit 50. The printer service unit 30 sends the ID information informed from the print control unit 40 to the database application 20. The database application 20 registers the print data, for which extra copies have been printed, and the informed ID information in the  
10 database file 21 in association with each other.

In other words, every time one image of print data registered in the database file 21 is printed, ID information for the print data is registered anew.

Fig. 2 shows an external view of the image forming system according to the first embodiment of the present invention. Fig. 3 is a block diagram  
15 schematically showing an internal structure of the image forming system according to this embodiment.

As shown in Fig. 3, the functions of the print application 10, the user file 11, the database application 20, the database file 21, and the printer service unit 30 are included in a computer 100, and the functions of the print control unit 40, the  
20 output paper ID monitor unit 50, and the print request ID monitor unit 60 are included in the printer 200. The computer 100 and the printer 200 are connected via a network.

The user file 11 and the database file 21 are saved in a hard disk in the computer 100.

25 Fig. 4 is an external view of the printer 200.

In the printer 200, paper is fed from the back of a main body thereof and discharged from the front of the main body after printing. In a course of the

printing, specific ID information incorporated in the RFID 80 attached to the print paper 90 is read by the output paper ID detector 70. In addition, the print request ID detector 71 is provided in the upper front part of the main body separately from the output paper ID detector 70. When the part of the printed print paper 90  
5 where the RFID 80 is attached is brought close to the upper front part of the main body, the specific ID incorporated in the RFID 80 of the printed print paper 90 is read by the print request ID detector 71.

The output paper ID monitor unit 50 includes the output paper ID detector 70, and the print request ID monitor unit 60 includes the print request ID detector  
10 71.

Fig. 5 is a block diagram showing an internal structure of the output paper ID detector 70 and the print request ID detector 71.

The output paper ID detector 70 and the print request ID detector 71 each include an antenna 72, an electric power circuit 73, and a receiving circuit 74.  
15 The electric power circuit 73 causes a high-frequency current to flow to the antenna 72 connected to the electric power circuit 73. In other words, the electric power circuit 73 supplies electric power to the antenna 72. At this point, the amplitude of the high-frequency current to be supplied to the antenna 72 is controlled to be constant. In addition, the electric power circuit 73 detects the  
20 high-frequency current and sends a signal of the high-frequency current to the receiving circuit 74. The receiving circuit 74 restores ID information according to a change in the signal based upon the high-frequency current from the electric power circuit 73. The output paper ID detector 70 and the print request ID detector 71 each output the ID information restored by the receiving circuit 74.

25 Fig. 6 is an external view of the print paper 90. As shown in Fig 6, the RFID 80 is attached to an upper left portion of the print paper 90. Fig. 7 is a block diagram showing the internal structure of the RFID 80.



As shown in Fig. 7, the RFID 80 includes an antenna 81, an electric power circuit 82, a control circuit 83, a nonvolatile memory 84, and a transmission circuit 85. The electric power circuit 82 receives high-frequency power, which is supplied from the output paper ID detector 70 and the print request ID detector 71, through the antenna 81. Subsequently, after rectifying the received high-frequency power, the electric power circuit 82 supplies the power to the control circuit 83, the nonvolatile memory 84, and the transmission circuit 85.

When the power is supplied, the control circuit 83 reads out specific ID information in the nonvolatile memory 84 after elapse of a predetermined time and converts the ID information into serial data. The transmission circuit 85 supplies a modulation signal to the electric power circuit 82 in accordance with the serial data converted from the ID information in the control circuit 83. The electric power circuit 82 varies its amount of power consumption in response to the modulation signal from the transmission circuit 85. This variation in power consumption is sent to the output paper ID detector 70 or the print request ID detector 71 through the antenna 81. Consequently, the output paper ID detector 70 and the print request ID detector 71 can obtain the ID information of the RFID 80.

In this manner, according to the present embodiment, in the case where the user desires to record an image, which is already printed once, on another recording paper again, the user can print the desired image anew with a simple operation of causing the printer 200 to read the RFID attached to the recording paper on which the desired image is printed.

Therefore, it is unnecessary to retrieve desired image data from the user file 11 of the computer 100.

Fig. 8 is a block diagram showing the structure of the image forming system according to the second embodiment of the present invention. In the

image forming system of the present embodiment, the component relating to the database is arranged on a network, which differs from the image forming system in the first embodiment. In other words, in the image forming system of the present embodiment, unlike the structure shown in Fig. 3, the database application 20 and the database file 21 are arranged in a computer 300 separate from the computer 100, in which the print application 10 and the printer service unit 30 are provided, and the computer 100 and the computer 300 are connected via a network. Accordingly, both computers 100 and 300 are provided with network service units 101 and 301, respectively.

In addition, the computer 100 including the printer service unit 30, is also connected to the printer 200 including the print request ID detector 71 and the like via a network. If ID information detected by the print request ID detector 71 is sent to the database application 20 from the printer 200 through the computer 100, it is possible to execute printing of a file corresponding to the ID information as described above.

Figs. 9 and 10 are block diagrams showing structures of the image forming systems according to the third embodiment and the fourth embodiment of the present invention, respectively.

The structure of the image forming system in the third embodiment of the present invention is different from the structure of the image forming system shown in Fig. 8 in that the printer 200 and the computer 100 are connected via a network.

In addition, the structure of the image forming system according to the fourth embodiment of the present invention is different from the structure of the image forming system shown in Fig. 8 in that the print request ID monitor unit 60 is separated from the printer 200, a request input apparatus 400 including the print request ID monitor unit 60 is provided anew, and the request input apparatus 400

and the computer 300 are connected via a network. Accordingly, computers 100 and 300, printer 200 and request input apparatus 400 are provided with network service units 101, 301, 201 and 401, respectively.

It is needless to mention that the image forming system shown in Fig. 9 or  
5 Fig. 10 realizes the same actions and effects as the image forming systems shown in Figs. 3 and 8.

The present invention is not limited to the structures described in the first to fourth embodiments, and it is possible to arrange every part of the block components shown in Fig. 3 on a network. In addition, a system configuration  
10 may be adopted in which the respective block components shown in Fig. 3 may be arranged on a network in plural.

According to the above-mentioned embodiments, in order to copy a print, an RFID part of the print, which a user desires to copy, is made to react to an ID detection unit of a printer or an independent ID detector to recognize print contents  
15 from ID information of the print to thereby print the print contents.

Therefore, an image quality of an image on a copied print is never deteriorated compared with that on an original print and the image on the copied print is not inclined. In addition, it is unnecessary to retrieve an original file of an image which a user desires to copy. Further, it is also possible to collectively  
20 manage documents according to a history of copying in a database.

Furthermore, although depending upon a structure of a printer to which the image forming system of the present invention is applied, it is also possible to adopt a single ID detector, which has both the functions of the output paper ID detector 70 and the print request ID detector 71, as alternative means. Moreover,  
25 according to the above-mentioned embodiments, print data and IDs of print paper are recorded in association with each other in the database file 21. However, the present invention can further register other information on the print data.

Examples of the other information on the print data include an ID of a computer which executes print processing and an ID of application software which is controlled the print processing in the computer.

When the print processing is executed by a user once, the information on  
5 the print data and the print data are registered in association with each other in the database file 21. In the case in which the user desires to copy this print data later, the user inputs the IDs of the computer and the application software using input means such as a keyboard. The database application 20 retrieves print data  
10 corresponding to the inputted information from the database file 20 and informs the printer service unit 30 of a result of the retrieval. In the case in which the print data is returned from the database application 20, the printer service unit 30 transfers the print data to the pertinent application software and causes the pertinent computer to execute print processing.

In addition, it is also possible to incorporate the database application 20  
15 and the database file 21 in the printer 200. In this case, it is possible to copy a print on the basis of the printing method unique to the present invention with the printer 200 alone.

Moreover, when a print is copied, in addition to an ID of print paper on which an image to be copied is printed, an ID of print paper on which the image is  
20 copied is also registered in association with the pertinent print data in the database file 21, whereby it is possible to copy the print data using any one of those kinds of print paper from then on.

Note that, in the present invention, a size of print paper is not limited, and the present invention is applicable to print paper of any size. In addition, print  
25 data is not limited to image data, and the present invention is applied to text data or the like.

In addition, the objects of the present invention are also attained by

providing a storage medium having stored therein program code of software,  
which realizes the functions of the above-mentioned embodiments, to a system or  
an apparatus, and by causing a computer (or a CPU or an MPU) of the system or  
the apparatus to read out and execute the program code stored in the storage  
5 medium.

In this case, the program code itself read out from the storage medium  
realizes the functions of the above-mentioned embodiments, and the program code  
itself and the storage medium having stored therein the program code constitute  
the present invention.

10 As the storage medium for supplying the program code, for example, a  
flexible disk, a hard disk, an optical disk, a magneto-optical disk, a CD-ROM, a  
CD-R, a magnetic tape, a nonvolatile memory card, a ROM, or the like can be  
used.

In addition, the present invention includes not only the case in which the  
15 functions of the above-mentioned embodiments are executed by causing the  
computer to execute the read-out program code, but also a case in which an OS (a  
basic system or an operating system) or the like running on the computer performs  
actual processing partly or entirely on the basis of an instruction of the program  
code, realizing the functions of the above-mentioned embodiments by the  
20 processing.

Moreover, the present invention also includes a case in which, after the  
program code read out from the storage medium is written in a memory provided  
in a function extending board inserted in the computer or a function extending unit  
connected to the computer, a CPU or the like provided in the function extending  
25 board or the function extending unit performs actual processing partly or entirely,  
thereby realizing the functions of the above-mentioned embodiments by the  
processing.

Many widely different embodiments of the present invention may be constructed without departing from the spirit and scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except  
5 as defined in the appended claims.